ED 326 195 IR 014 735

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TITLE Educational Technology and the Restructuring Movement: Lessons from Research on Computers in Classrooms.

PUB DATE 90

NOTE 9p.; Paper presented at the Annual Meeting of the American Educational Research Association (Boston, MA, April 16-20, 1990). For related papers, see IR 014 736-738.

PUB TYPE Speeches/Conference Papers (150) -- --

EDRS PRICE MF01/PC01 Plus Postage.

DESCRIPTORS *Adoption (Ideas); Computer Assisted Instruction; *Educational Change; Educational Technology; Elementary Education; *Instructional Innovation; *Microcomputers; *Program Implementation; Teacher Attitudes; Teacher Role

ABSTRACT

This paper presents findings from a recently completed study of the use of computers in primary classrooms as one source of evidence concerning the role technology can play in school restructuring efforts. The sites for the study were selected by Apple Computer, Inc. in the spring of 1988 and included 43 classrooms in 10 schools in 6 large, mostly urban districts. The research goals were to understand the effects of classroom-based computers and the Apple Learning Series: Early Language (ALS-EL) software on teachers and students and on teaching and learning, to identify patterns and trends in ALS-EL use, and to determine the factors that contribute to the successful integration of computers in classrooms. Each of the six districts was visited four times during the 1988-89 school year. Open-ended interviews were conducted with ALS-EL teachers and with school administrators, and language arts instruction and computer use were observed in the classroom. It was concluded that computers in classrooms served a support role for instructional changes when conditions conducive to change were already in existence. Such conditions include: (1) a shared vision of teaching and learning; (2) leadership and support for the use of new technologies from school administrators; (3) organizational conditions allowing teachers flexibility, time, and incentives to experiment with new instructional methods; (4) opportunities for communication, interaction, and peer support among teachers; and (5) training and personalized support over time for teachers. (9 references) (DB)

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EDUCATIONAL TECHNOLOGY AND THE RESTRUCTURING MOVEMENT: LESSONS FROM RESEARCH ON COMPUTERS IN CLASSROOMS.

by

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EDUCATIONAL TECHNOLOGY AND THE RESTRUCTURING MOVEMENT: LESSONS FROM RESEARCH ON COMPUTERS IN CLASSROOMS

Diane Kell, Glen Harvey, and Nancy Gadzuk Drexler*

The idea of transforming classroom teaching and learning through use of advanced technology is older than the idea of computers in classrooms. Indeed, from textbooks and chalkboards to radio, film, and television, *"Claims predicting extraordinary changes in teacher practice and student learning, mixed with promotional tactics, dominated the literature in the initial wave of enthusiasm for each new technology"* (Cuban, 1986, p.4). Computers joined the list of technologies promoted for use in schools more than twenty years ago; but then, after an initial flurry of interest in computer assisted instruction, the use of computers languished in schools until the 1980s. Then, *"with the advent of inexpensive desk-top machines and the promise of each student interacting with a personal computer, claims for a classroom revolution surfaced again"* (Cuban, 1986, p.73).

Most studies of the effectiveness of educational computing emphasize the role of computers in reinforcing or enhancing the traditional basic skills (i.e., reading and math). However, some advocates for educational computing envision a much more powerful effect on teachers and students, and on the teaching and learning process (see, for example, Weir, 1989; Laboratory for Comparative Human Cognition, 1989). Moreover, there has recently been a resurgent interest in radically transforming schools to allow for more active, hands-on, student-directed learning, independently and in groups; and computers in classrooms are often seen as both a catalyst and a support for making this transformation (see, for example, Pearlman, 1989).

This paper presents findings from a recently completed study of the use of computers in primary classrooms as one source of evidence concerning the role technology can play in school restructuring efforts. In particular, this paper urges would-be reformers to be realistic about the kinds of transformation that might occur when computers are placed in the hands of classroom teachers under normal conditions.

Study Background

Our sites were demonstration sites for a new program of K-2 computer-based language arts instruction developed by Apple Computer, Inc., and marketed as The Apple Learning Series: Early Language (ALS-EL). Each participating classroom received the same configuration of hardware and peripheral devices to support the ALS-EL program, including three computers and a printer, two speech synthesizers, a touch screen, and a keyboard designed especially for children.[1] Apple Computer also provided one full-day, or two half-days, of teacher inservice training per site, plus an ALS-EL teacher's manual for every teacher.

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*This paper was presented at the 1990 annual conference of the American Educational Research Association. The research reported in this paper was supported by Apple Computer, Inc., and conducted by The Regional Laboratory for Educational Improvement of the Northeast and Islands, 300 Brickstone Terrace, Suite 900, Andover, MA, 01810. We also want to acknowledge the contributions of our colleagues: Lynne Krensky, Robert Thomas, Felisa Tibbitts, Kirsten Schaetzel, Carol Red, and Elizabeth Wertz. However, the views presented in this paper are our own and are not necessarily those of our colleagues, The Regional Laboratory, or Apple Computer, Inc.

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In addition, each teacher received the ALS-EL bundle of commercially produced early language software.[2] The individual pieces of ALS-EL software -- ranging from phonics and skills practice programs to word processing and graphic arts programs for children -- represent truly diverse approaches to early language instruction. Taken together, they might be viewed as methods for attending to the different learning styles and needs of young children and the varying skills involved in developing literacy. The developers at Apple Computer, Inc., expected teachers to use the software flexibly to create an integrated, multifaceted learning experience for children.

The sites for the study were selected by Apple Computer in the spring of 1988. Including 43 classrooms in ten schools in six large, mostly urban districts, they represented tremendous diversity in geographic location, student demographics, approaches to language arts instruction, classroom design, and school or district resources to support school improvement. All of the participating classrooms included a high proportion of children who were economically disadvantaged, limited English speaking, or members of racial or ethnic minority groups.

Our study was conducted during the 1988-89 school year. Our research goals were to understand the effects of classroom-based computers and the ALS-EL software on teachers and students and on teaching and learning, to identify patterns and trends in ALS-EL use, and to determine the factors that contribute to the successful integration of computers in classrooms.

Ours was not a study of school restructuring efforts. We viewed the use of computers in classrooms from the perspective of implementation research, not from the perspective of the movement to redesign schools; and we considered the implementation issue mostly from the perspective of individual adopters, the teachers in classrooms. We hypothesized that teachers' attitudes about computers, their configurations of computer use, and their levels of implementation quality, all would be influenced by teachers' personal orientations as well as by organizational supports and constraints seen mostly from their perspective.

Because of the amount that's been written on computers as tools for change, we did look for changes in ALS-EL classrooms. We looked for changes in language arts instructional practices, classroom organization and classroom management approaches, and the relationships of teachers to students and students to one another. More specifically, we looked for increased diversity and flexibility in the instructional environment; more active, student-directed and student-centered learning; and increases in peer tutoring or small-group cooperative activities.

We also looked for evidence that teachers were viewing students in a new light. We wondered if teachers' observations of children's work on computers might lead them to more individualized knowledge of the students' skills and needs, more awareness of the different kinds of intelligence and non-academic strengths children might have, or different views about the teaching and learning process (e.g., for teachers with very traditional perspectives on teaching, this might mean developing a new understanding of the pedagogic value of exploratory, problem-solving or creative activities, or realizing the value of encouraging children to write even before they've mastered the conventional forms of writing).

We included organizational supports and constraints in our conceptual framework for explaining teacher attitudes and behaviors, but because we were not connecting our inquiry to the larger issues of school restructuring, we did not devote as much effort as we might have done to school reform issues at the district or building level.

Study Methods

We visited each of the six districts four times during the 1988-89 school year -- in October, January, March, and May. Each visit lasted four or five days, with a two-person field team, for a total of 32 to 40 person-days of field work per district site. During each field visit, we conducted open-ended, semi-structured interviews with ALS-EL teachers (about 45 minutes to an hour with each teacher) and with school administrators (generally one to two hours for an administrator) and observed approximately two hours of language arts instruction and 45 minutes of children's computer use in each classroom.

We asked teachers to complete three written survey questionnaires -- in October, January, and May. The October and May surveys included the DeFord Theoretical Orientation to Reading Profile (TORP). Developed by Diane DeFord at Ohio State University, this instrument assesses teachers' orientations to early reading instruction along a continuum from phonics to whole language (see DeFord, 1985). The January and May surveys included the Stages of Concern (SoC) questionnaire from the Concerns-Based Adoption Model (see Hall & Hord, 1987).

As sources of analytic propositions, we drew on site-level analytic memos written by the field researchers as well as extensive, structured discussions at analytic meetings attended by all six field researchers and the principal investigator. The propositions were then tested by asking each field researcher to complete a chart of the evidence in their field reports for each proposition, including negative evidence as well as evidence supporting the proposition. For some propositions, we also constructed contingency tables and other kinds of data display.

Major Findings

This opportunity to reflect on our study conclusions from the perspective of the school restructuring movement is welcome, because we believe some of our findings are relevant to those issues. For example,

1. We do not find much evidence that computers by themselves served as catalysts for change in classroom instruction. Teachers' use of computers instead matched their customary teaching styles and approaches. With regard to language arts instruction, teachers who favored a phonics-based approach generally favored the phonics-based skills software, while those who favored the whole-language approach preferred the more open-ended graphics and word processing software.

2. In some classrooms taught by teachers with more traditional approaches to classroom management and instruction, the children's independent or peer group work on computers represented very different kinds of activity than the traditional whole-class, teacher-directed instruction that the teachers customarily provided. In

these classrooms, the introduction of ALS-EL could possibly lead to more profound changes over time by "unfreezing" more rigid patterns of instruction. However, within the limited time frame of our study, we did not observe parallel changes in the flexibility of noncomputer-based instructional activities.

3. Many teachers do view computers as valuable resources supporting their instructional goals; and these teachers represent diverse classroom management and language arts instructional approaches. Thus, the flexibility of the computer as a tool for instruction is both a positive feature, in terms of facilitating the use of computers in classrooms, but also a reason to reject the idea that technology automatically results in redesigned methods of instruction. Some uses of technology merely transfer traditional methods of instruction to a new medium.

4. Levels of implementation and types of ALS-EL use are influenced by teachers' general orientations toward teaching and learning, including: their experience with centers-based classroom design; their beliefs about the appropriate locus of control, choice, or initiative in the classroom; their attitudes toward student conversation, movement, or self-expression; their beliefs about how children acquire skills or develop knowledge; and their emphasis on individual performance versus cooperative learning. Teachers whose views are already "neoprogressive" and whose classroom environments already include individual or small-group learning stations find it much easier to integrate the use of computers into their classroom instruction and tend to implement at higher levels.

5. While personal orientations were definitely influential, we also observed great variation across sites in the organizational conditions that support or constrain teacher experimentation and the successful use of computers, including: curriculum policies and their enforcement; availability of resources for technical support and staff development; levels of opportunity for collegial communication, peer support, and collaborative decision making; leadership and vision provided by school administrators; and the presence or absence of concurrent curricular reforms that support the use of technology.

Conclusions

We are well aware that major change takes time to implement. In the language of the Concerns-Based Adoption Model, *"change is a process, not an event"* (Hall & Hord, 1987). Under the best circumstances, it takes two to three years for new users of complex innovations to move through the early stages of awareness and preparation in relation to an innovation; next, to begin using the innovation, at first mechanically and then more smoothly; and, later, to begin refining their use of the innovation, perhaps integrating it with other modifications in their routine practice, and assessing its consequences for students. Our study of the classroom use of computers took place during the first year of ALS-EL use following the introduction of computers to classrooms the previous spring. Therefore, we should be clear that we did not expect to see classrooms completely transformed in our year of observations.

Notes

1. The recommended configuration of hardware and peripherals for the Apple Learning Series: Early Language includes one Apple IIGS 512K RGB Professional System; two Apple IIe Color Classroom Systems; one Apple ImageWriter II Printer; the Muppet Learning Keys from Sunburst Communications; two speech synthesizers from Street Electronics, an Echo+ and an Echo IIb; and the Touch Window from Personal Touch Corporation, a division of Edmark.

2. ALS-EL includes some of the most highly recommended software available from commercial publishers of software for young children. [For an independent rating of early childhood software, see Buckleitner (1989).] Muppets on Stage, Muppetville, and Muppet Word Book (from Sunburst Communications) provide practice in letter, number, shape, and color recognition; matching of upper- and lower-case letters; consonant and vowel identification; and other classification skills. Touch 'N Write (also from Sunburst) uses the touch screen to provide practice in letter formation. Sound Ideas: Consonants, Sound Ideas: Vowels, and Sound Ideas: Word Attack (from Houghton Mifflin) make use of electronic voice synthesizers to help students develop symbol-sound correspondence and word attack skills. ColorMe (from Mindscape) and Where Did My Toothbrush Go? (from D.C. Heath's Explore-A-Story Series) allow children to create and explore combinations of graphics, letters, and words. Talking Text Writer (from Scholastic Software) and the writing slate in the Muppet Word Book enable children to express their ideas in writing, see their own words in print, and share them with others. Talking Text Writer also includes a sound component, which lets children hear the letters, words, or texts they have written.

3. See also Harvey, Kell, & Drexler (1990) and Drexler, Harvey, & Kell (1990).

Still, our findings are a useful reminder that teaching and learning are not automatically and instantly transformed by placing computers in classrooms. In fact, we believe our findings support the conclusion that others have reached regarding the role of technology in restructuring education (see, for example, Pearlman, 1989; Cuban, 1989; and LaFrenz & Friedman, 1989).

Briefly, their conclusion is: TECHNOLOGY ALONE DOES NOT CHANGE SCHOOLS. Technology can be used to support a vision for reform that already exists, if the vision is one that is shared by teachers, and if organizational conditions are supportive; but putting computers in classrooms will not by itself lead teachers to view teaching and learning differently, nor will it provide all the resources they need to transform instruction.

As others have written, computers are most likely to support transformational changes in curriculum or instructional practice when certain conditions and circumstances exist. They are:

1. A concerted, collegial effort to develop a new vision of teaching and learning. There has to be a vision for reform that goes beyond using new technologies for instruction, and that vision has to be shared with and supported by teachers.

2. Leadership and support for the use of new technologies from district and school administrators but with meaningful involvement of teachers in choosing the new technologies and deciding how to use them.

3. Organizational conditions that allow teachers the flexibility, time, and incentives to experiment with curricula and with new instructional methods. Foremost among these conditions would be the elimination of bureaucratic controls that serve as disincentives for change (e.g., rigid curriculum requirements, high-stakes basic skills testing).

4. Opportunities for communication, interaction, and peer support among teachers who are using the new technologies.

5. Training and personalized support that are provided over time, that acknowledge and validate teachers' concerns about using the new technologies, and that address teachers' concerns in a positive, constructive manner.

In our research, there was one site, at most, where most of these conditions were met. All seven teachers who were given computers in this school were using them in creative ways to support a new, district-wide program of language arts instruction. In this site, computers were viewed as a valuable tool for actively engaging students in personally meaningful, individualized and cooperative learning experiences consistent with the goals of the new program. In other sites, we found not only a lack of organizational supports for teachers' individual change efforts but also a lack of shared vision about what changes in practices *should* take place.[3]

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